CHBE 303 — Computer Programming in Chemical Engineering (Fall 2014)

Classes: HRZ 212 (T: 7 - 8:59 PM)
Recitation: SEW 101 (W: 7-9 PM), MEB 128 (F: 3-5 PM), MEB 128 (Su: 3-5 PM)
Instructor: Dr. Dilip Asthagiri
Office hours: by appointment

Syllabus

1. Class 1 — Introduction

   Computers in chemical engineering
   Hardware, software, how computers store data, and the need for high level languages
   Introduction to the MATLAB environment
   - Reading assignment (Chapter1.pdf of text on OwlSpace)

2. Class 2 — Introduction to MATLAB data types

   Data types
   Variables and Assignment Statements
   Numerical Expressions
   Characters and Encoding
   Relational Expressions
   Vectors and Matrices
   Vectors and Matrices as function arguments
   Scalar and Array Operations on vectors and matrices
   - Home work 1

   ⇒ Reading assignment (Chapter2.pdf on OwlSpace)

3. Class 3 — Programming: Scripting, input, and output

   Examples that demonstrate scripting
   - Home work 2

   ⇒ Reading assignment (Chapter3.pdf on OwlSpace)

4. Class 4 — Programming: Branching and selection

   Examples that demonstrate basic branching and selection control structures
   - Home work 3

   ⇒ Reading assignment (Chapter4.pdf on OwlSpace)

5. Class 5 — Programming: Loops and vectoring

   Examples that demonstrate use of loops and vectorizing specific to MATLAB
   Code timing
   - Home work 4

   ⇒ Reading assignment (Notes and Chapter10.pdf on OwlSpace)

6. Class 6 — Graphing data and basic statistics with Matlab

   Plot functions, customizing plots, saving and printing plots

   We will also review basic statistical operations

   - Home work 5

   ⇒ Reading assignment (Notes)

7. Class 7 — Solving linear/nonlinear systems

   We will use MATLAB to solve sample problems in chemical engineering unit operations and design

   - Home work 6

   ⇒ Reading assignment (Chapter5.pdf on OwlSpace)

8. Class 8 — Programming: Basics of modular programming

   We will introduce modular programming and basic debugging techniques and see these be used in examples (classes 9-11)

   - Home work 7

   ⇒ Reading assignment (Chapter6.pdf on OwlSpace)

9. Class 9 — Programming: Basics string manipulation

   Example of a code to convert DNA sequence to protein sequence

   - Home work 8

   ⇒ Reading assignment (Notes)

10. Class 10 — Example: Random walk

    We will bring all of the ideas developed above to model the movement of a particle suspended in a medium

    - Home work 9

    ⇒ Reading assignment (Notes)

11. Classes 11 — Example: Monte Carlo simulation of a van der Waals fluid

    We will develop a simple, yet realistic, Monte Carlo simulation code to model a van der Waals fluid. In this process we will also review all of the programming ideas we considered in earlier classes.

    - Home work 10

Important notes

1. Programming can only be learnt by actively trying ideas on a computer. You will fail many times (as I do even now!), but it is important to learn how to get help and move forward.
2. Classes 2-11 will be largely interactive with little formal lecturing.
3. PDF chapters from *MATLAB — A practical introduction to programming and problem solving* by Stormy Attaway will be posted on OwlSpace. PDF of slides of the lectures will also be posted ahead of time (starting class 2). You should prepare for each class by reviewing the material and coming to the class ready to ask questions.

4. You are expected to attend the recitation section and work together with the TAs to solve problems.
5. **Use your time effectively! Come prepared to class!**

Course materials

1. Slides and PDF of the book chapter will be posted on OwlSpace.
2. Programming can be learnt only by doing. The computer labs are a valuable resource, but you are **very strongly encouraged** to get a copy of the software for your personal computer. This will give you much freedom to experiment on your own and learn better. Of course, this tool will be **essential** in subsequent chemical engineering courses.
3. Get the student version of MATLAB and Simulink together (version R2014a; cost $99):
https://www.mathworks.com/store/link/products/student/?s_tid=ac_buy_sv_cta

Homework and grading policy

1. We will have 10 assignments. These need to be completed by their due dates.
2. **There will be no exams.**
3. **Read carefully the CHBE 303 homework policy and follow the instructions**
4. Late home work will be penalized, unless prior permission has been obtained from the instructor.
5. Home works will be marked as either correct or incorrect. No partial credit will be given.
6. If a home work problem is not completed correctly, you will be given one more opportunity to complete it correctly. Submissions for regrades will be due one (1) week after the graded assignments have been returned to the students by the TAs.
7. The final grade earned will depend on the **total points of homework problems turned in on time and correctly completed**.
8. Grades will be assigned as follows:

   A : More than 90% of total points
   B : More than 80% but less than 90% of total points
   C : More than 70% but less than 80% of total points
   D : More than 60% but less than 70% of total points
   F : Less than 60% of total points

Lab sessions

A computer lab session will be held during the week before an assignment is due. The class will be divided in sections for the computer labs. **Attendance of the computer lab sessions is mandatory**.

Honor code Policy

"Students are encouraged to talk to each other, the teaching assistants, the instructor, or anyone else about any assignment in the course that is not specifically designated as pledged. This assistance if limited to the discussion of the problem and perhaps sketching of a solution. Consulting another student's solution is prohibited and submitted solutions to assignments may not be copied from any source."

ADA Statement

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with the instructor during the first two weeks of class. All discussions will remain confidential. Students with disabilities will need to also contact Disability Support Services in the Allen Center.

Teaching Team

We have a fantastic group of undergraduate and graduate students to help you learn.

Instructor	Dr. Dilip Asthagiri: `Dilip.Asthagiri@rice.edu`
Graders	Taylor Boelkes: `tnb2@rice.edu`
	Dana Glicksberg: `dcg9@rice.edu`
	Alison Lindsay: `acl11@rice.edu`
Teaching Assistants	
Wednesday	Teju Kishore: `tk14@rice.edu`
	Michael Mardock: `mam12@rice.edu`
	Sarah Munday: `ssm3@rice.edu`
Friday	Ali Al Hammadi: `aaa13@rice.edu`
	Hojin Jeon: `hj5@rice.edu`
	Jiating Jiang: `jj28@rice.edu`
Sunday	Junli Hao: `jh29@rice.edu`
	Ziyi Zhu: `zz27@rice.edu`
	Hojin Kim: `hk12@rice.edu`